

Application No. 10/029,533  
Reply to Office Action dated May 15, 2003

### REMARKS

The Examiner is thanked for the Office Action mailed May 15, 2003. Please enter the following response.

The Examiner rejected the first set of independent claims as anticipated by Schwarz et al., U.S. Patent No. 4,041,276. The Examiner rejected the remaining claims as anticipated by Williams, U.S. Patent No. 5,243,212 or obvious in view of Williams combined with other prior art references. This response is in reply to the Office Action.

Claim 1, as amended specifically states that the integrated heater includes, as part of the semiconductor material a fluid retaining chamber integral with the semiconductor material, the sidewalls of the chamber being formed of the semiconductor material. The claim has also been amended to make clear that the object to be heated is positioned within the chamber composed of the semiconductor material.

Claim 1, as amended is similar in scope to previous claim 3 and includes a clear limitation that the retaining chamber is integral with the semiconductor material.

Schwarz et al. '276 is not an integrated heater. In Schwarz, the transistor which performs the heating is in a separately encapsulated container. It is stated in the specification of Schwarz '276 that it is enclosed within a metal casing. The transistor of Schwarz '276 is formed in a semiconductor material and then is placed in some kind of a potting compound after which the entire potting compound and transistor is enclosed within a metal casing, see for example column 2, lines 27-30, which refer to the transistor being in a pot-like. As a separate structural element, a heating block 1 is formed and a heat conducting paste or adhesive is provided so that the metal case of the transistor may be adhered to the separate metal block as can be easily seen in figure 1 of the Schwarz '276 patent. In addition, a PTC resistor is provided on a top portion of the metal block, element 7 of figures 1 and 2. The fluid channel is in a separate plate that has formed separately then later glued to the outside package of the potted transistor.

Schwarz does not teach an integrated heater composed of semiconductor material. There is no fluid retaining chamber that is integral with the semiconductor material and the fluid to be heated is not positioned within a chamber composed of semiconductor material. Claim 1 is clearly patentable over Schwarz et al.

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The Examiner also rejected claim 1 as being anticipated by the Williams '212 patent. The Examiner stated that Williams taught an integrated heater which included a semiconductor substrate and source and drain regions, referring to claim 1 of Williams '212 patent. The Examiner also stated that Williams taught a fluid chamber to be heated. Applicants' strongly disagrees.

Applicant has studied the Williams '212 patent in detail and finds no mention of an integrated heater. In addition, there appears to be no mention of any fluid chamber or any material to be heated. Applicants' attorney was unable to find any reference in the Williams '212 patent to any use of the transistors as a heating element or any reference to an object which is to be heated. Clearly, Williams does not teach any features of the claimed invention. The Examiner is respectfully requested to point out any locations in the Williams '212 patent which shows such an integrated heater and a fluid chamber to be heated if the Examiner believes they are present in this reference.

Claims 4-8 and 10-19 are each patentable for independent reasons beyond the patentability of claim 1. Claim 4, for example claims a semiconductor wall portion and a body having a wall portion positioned adjacent to an ensuing engagement with the semiconductor wall portion. None of these features are showing any of the prior art references. Claim 5 specifies a dielectric layer extending over the semiconductor wall portion and facing toward the fluid chamber, the dielectric layer being positioned between the semiconductor material and the chamber. Again, this feature is not found in nor suggested by any prior art reference. Similarly, each of the limitations in remaining claims 6-8 and 10-19 are not found in any of the prior art references and the limitations are not mentioned here in order to reduce the space. However, each of these claims contained specific limitations which are not found in nor obvious in light of the prior art.

Claim 21 is clearly patentable in light of Schwarz '276. Claim 21 as amended states that the integrated heater includes a chamber for containing a fluid to be a heat receiving chamber with the semiconductor material and coupled. Schwarz et al. '276 does not show an integrated heater in which a heat receiving chamber is integrally formed with the semiconductor material. As stated previously, Schwarz shows a metal encased transistor, which after it is

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formed, potted and encased within metal is thereafter attached by some type of paste to a separate metal block, which metal block has formed therein a fluid chamber through which fluid runs. This is distinctly different from the present invention in which the heat receiving chamber for containing the fluid is integrally formed with the semiconductor material using VLSI techniques.

In addition, according to claim 21 of the present invention a plurality of transistors are formed in the semiconductor material for producing the heat. Of course, the transistors can be positioned spaced from each other with separate chambers, replicating the structure figures 1-5 or alternatively, the plurality of transistors maybe positioned adjacent a single heat receiving chamber as shown in figure 6. The structure of Schwarz et al. does not teach or even suggest the use of a plurality of heat producing transistors. Rather, there is a single heat producing transistor and a controlled transistor 16. The present invention, because it is an integrated chip may have in the range of a million transistors per chip, all integrated into the same semiconductor material. Schwarz et al. '276 does not teach or even suggest such an integrated heater.

Claim 22 has been amended to also contain subject matter patentable beyond the patentability of claim 21. Claim 22 further specifies that the heat receiving chamber is an integrated fluid chamber positioned adjacent to the semiconductor material. This corresponds, for example to the embodiments of figures 2, 4, 5 and the like in which the chamber may be composed alternatively of a separate material from the semiconductor material itself, but is still part of the integrated wafer and is an integrated circuit, being formed by VLSI techniques integral with the semiconductor substrate. Certainly, Schwarz et al. '276 does not teach such a chamber or material that is integral with the semiconductor substrate.

Claim 24 is patentable in light of Williams '212 patent. As previously stated, Applicants' attorney has been unable to find anywhere in the Williams patent that refers to an integrated heater or any heating taking place. Claim 24 is believed patentable as presented and no amended is made to claim 24. In particular, Williams completely fails to show or suggest a channel region having a resistance when conducting current to generate heat above a selected threshold. He also fails to suggest an object to be heated positioned to receive the heat generated

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by the resistance of the channel region. The other features of claim 24, all comprising integrated heater are not shown in nor obvious from the Williams patent either alone or taking in combination with any other cited reference.

The Examiner states that Stumborg et al. '066 discloses a thermally insulating barrier 47 and 49, (Figure 8). Applicant disagrees. Stumborg identifies these as a thin diffusion barrier 47 of barium, see column 12, lines 39-51. This is called a very thin barrier, see column 12, line 62. There is no discussion of the thermal properties of this thin barium layer as compared to the other materials of the chip of Stumborg et al. '066. Stumborg et al. '066 fails to provide the missing features of the Williams '212. The claims remain patentable over the combination of Williams '212 and Stumborg et al. '066.

Newly submitted claim 44 contains additional limitations beyond those found in claim 24. For example, new claim 44 specifies that the channel region has a heat producing resistance and that a chamber to be heated is formed integral with the integrated circuit to receive the heat generated by the resistance of the channel region. Claim 44 is believed patentable in light of the prior art for the same reasons discussed with claim 24 and in addition has the further limitations of the chamber being formed integral with the integrated heater.

Newly submitted dependent claims 45-49 add further limitations to claim 21.

Ferla et al. '412 fails to provide the missing teachings of the Williams '212 patent. It does not show structures that correspond to claimed windows of claims 8 and 12-15. There is no teaching in the combination of Williams '212 and Ferla et al. '412 to having a windows positioned above the integrated transistor to receive heat from the transistor.

The claims, which are believe patentable in light of the art of record arc respectfully submitted for further consideration by the Examiner and a Notice of Allowance is earnestly requested.

The Commissioner is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

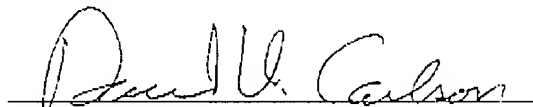
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All of the claims remaining in the application are now clearly allowable.  
Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

Gaetano Santoruvo et al.

SEED Intellectual Property Law Group PLLC



David V. Carlson

Registration No. 31,153

DVC:lcs

701 Fifth Avenue, Suite 6300  
Seattle, Washington 98104-7092  
Phone: (206) 622-4900  
Fax: (206) 682-6031

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